4 Living in the Water

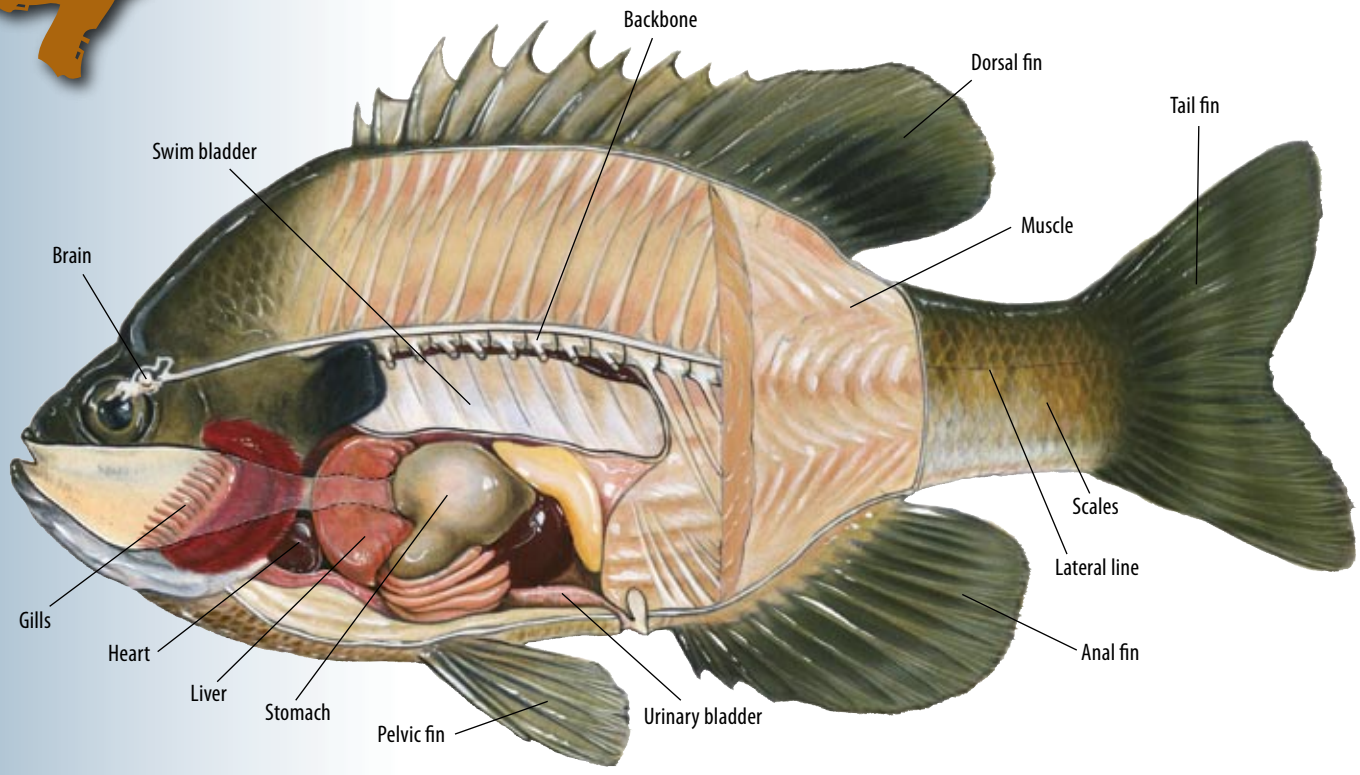

FIG. 4.1—Gills enable fish to take in oxygen and get rid of carbon dioxide by moving water over them.

Questions to consider

1. What is a species?
2. What is an adaptation?
3. How are fish adapted to aquatic environments?
4. How do fish swim? Why don't fish sink to the bottom or float on top of the water?
5. How do fish see, smell, hear, taste and feel?
6. What are some adaptations of different species of fish native to Missouri?
7. How do specific adaptations provide survival advantages to particular species?

You walk beside a pond. A red-winged blackbird flies overhead. A bluegill swims in the water. Humans, red-winged blackbirds and bluegill are distinct species. A species is a group of individuals sharing some common characteristics or qualities and whose offspring also share those characteristics or qualities. In other words, a species is a particular kind of creature. All species are specially suited for the lives they lead. Humans are perfect walkers, adapted to life on land. Red-winged blackbirds are perfect fliers, adapted to life in the air. Bluegills are perfect swimmers, adapted to living in water. An **adaptation** is a behavior or trait that increases a species' chance of survival in a specific environment. Every living thing must fit how it lives and where it lives. If it doesn't, it won't survive.

Fish guts

All fish are cold blooded. Their body temperature depends on the surrounding water temperature. This means they need less oxygen and energy to live than warm-blooded animals do. Fish have many of the same internal organs as we have. They have a heart to pump blood, intestines and stomach to digest food, a kidney, a liver, a gall bladder and a spleen.

All fish have **gills** to get oxygen from the water. Fish absorb dissolved oxygen from water passing over their gills. The gills contain capillaries (fine blood vessels) that absorb up to 85 percent of the oxygen available in the water and release carbon dioxide. Fish and amphibians are the only vertebrates (animals with a backbone) that are able to live in water without breathing air from the atmosphere. (FIG. 4.1)

How fish swim

Up to 80 percent of a fish's body is made of muscle. These bulging muscles are packed along its sides. That's where a fish gets most of its swimming power. When a largemouth bass wants to move forward, it begins a side-to-side wiggle that starts at its front and moves to its back. As this wiggle goes backward, the fish goes forward.

Fish also use their many **fins** to move about in the water. Coordinating all these fins comes naturally to them. The dorsal fin, located along the back of a fish, works like the keel of a boat. It helps keep the fish upright and stable. Some fish have split dorsal fins. Some species of fish, such as sunfish, have sharp spines in their fins to discourage other fish from eating them.

Most fish use their pairs of pectoral and pelvic fins, which are located along their sides, to steer or maneuver. These fins move independently, giving the fish the ability to move quickly in any direction. They can be used as brakes or rudders to help the fish stop, turn or go up or down or, in some cases, backward. Some fish rely on these or other fins rather than body movements to propel themselves forward part of the time. These fish usually aren't very fast. However, they are well adapted for moving in and out of tight places to catch food or to escape from other fish that want to eat them. Their ability to maneuver helps them survive.

Sink or swim

Swim bladders keep fish from sinking. The swim bladder works a little like a hot air balloon. The more air it contains, the higher a fish will suspend or float in the water. A fish can swim deeper or shallower, but the swim bladder takes a little time to adjust to the new depth.

Most fish are covered with **scales** that protect a fish as roof shingles protect a house. Fish don't grow more scales as they get older, the scales just get bigger. Scientists can determine a fish's age by counting the rings on a scale, similar to the way foresters can tell a tree's age by counting its growth rings. Fish are coated with slime, which helps reduce friction as they swim through the water. The slime also helps protect them from disease.

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FIG. 4.2—Protective coloration helps this sculpin avoid predators.

Almost every fish species is dark-colored across the back and light on the belly. This helps them blend in to the dark bottom when seen from above, and with the bright surface when seen from below. Many other color adaptations allow fish to blend in to their surroundings. For example, you must look very closely to see a sculpin sitting on a gravel **streambed** (the bottom of the stream) because of its ability to blend into its multicolored surroundings. (FIG. 4.2)

Fish sense

Fish have senses to see, hear, smell, taste and feel. The senses of some fish are better developed than those of others. Some fish use their sense of smell or taste to find food. Others feed primarily by sight. All fish are nearsighted, but the placement and shape of their eyes allows them to see almost all the way around their bodies. Fish can see colors, but those that feed at night or live on the bottom rely heavily on their excellent sense of smell. Fish have super hearing, especially for low-frequency sounds. A fish's ears are located beneath the skin on either side of the head. Fish also have a sensitive line along their sides, called a **lateral line**, which lets them sense water vibrations coming from each direction. Lateral lines are usually visible as faint lines like racing stripes. These run lengthwise along each side from the gill covers to the base of the tail. "Keep quiet or you'll scare away the fish" is good advice when you're on a fishing trip.

Fish have been on Earth for more than 400 million years. Today there are about 21,000 species worldwide and over 200 in Missouri. Each kind of fish has its own way of surviving. The diversity of fishes shows us how fish have adapted to live in a variety of environments. They thrive in the murky depths of the muddy Mississippi River, in the cypress swamps of southeast Missouri and in complete darkness in Missouri's many caves. Bluegill, catfish and bass live in most Missouri waters. Each of these is adapted to play a different role in the aquatic environment. Their adaptations of body shape, mouth size and coloring help them to survive. The different adaptations of these species show how fish are adapted to life in Missouri's waters.

Bluegill

Bluegill have thin bodies, short heads and small mouths. (FIG. 4.3) Their thin, disk-shaped body is ideal for short, quick turns. They need to be fast to catch food

among plant stems. They have a small mouth because they eat small insects. Their protective coloring helps them hide from their enemies. Small bluegill are a favorite food of bass.

FIG. 4.3—Bluegill

FIG. 4.4—Channel catfish

FIG. 4.5—Largemouth bass

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Channel catfish

Channel catfish have long, round bodies that are flattened on the bottom. (FIG. 4.4) They have skins without scales. They scavenge along the bottom of ponds or rivers for fish, frogs, crayfish and other foods—dead or alive. They are adapted to feed at night. They depend on barbels or "whiskers" with many taste buds and a good sense of smell to guide them to food even in dark, muddy waters. In fact, catfish have taste buds all over their bodies, including the tail. They can taste food even before taking it into their mouths. Their skin color camouflages them against pond and river bottoms. Channel catfish are adapted as bottom rovers. Small catfish are a favorite food of bass.

Largemouth bass

Largemouth bass live in clear waters that have many weeds. (FIG. 4.5) They are **predators**, meaning that they eat other animals, which are called **prey**. Their large mouths enable them easily to catch frogs, fish, crayfish and other animals. Their broad fins and strong, heavy bodies allow them to go in any direction (even backwards) as they seek food. Wide, sweeping tails give these predators quick powerful starts, enabling them to ambush their food. The colored blotches on their sides hide them well in weeds. Largemouth bass and many other popular Missouri game fish are roving predators, and they have similar adaptations.

Fish farming in Missouri

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Fish farmers raise fish in artificial conditions for stocking, to use as bait or, in some cases, to eat. They must purchase their breeding fish from a commercial fisherman or another fish farmer, or keep their own captive breeding stock. Hatchery workers spawn fish by hand and grow them to a size large enough to use. Here, a hatchery worker squeezes sperm from a male trout into a bowl of eggs to fertilize them. Hatchery workers check fish health, spot fish diseases and control diseases with drugs. They keep hatchery records and write fish-production reports. The Missouri Department of Conservation operates two kinds of fish hatcheries. Warm-water hatcheries raise mostly native fish. Cold-water hatcheries raise trout, which are not native to Missouri, but which can survive in some spring-fed Ozark streams. Trout are very popular with fishermen. Channel catfish and trout also are raised for food in private fish farms in Missouri. Many hatchery workers have a bachelor's degree in fisheries management or biology.